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URAL COPPER MINE MECHANIZES;  
POSTWAR COPPER OUTPUT UP 81 PERCENT

[Numbers in parentheses refer to appended list of sources.]

The Blyavinskiy Mine in the Urals is a large mining enterprise extracting copper-sulfur ores by underground methods. The largest lentil, the Severnaya of the deposit is the one being worked at present. The lentil which contains up to 90 percent of all reserves of the deposit, is 500 meters long along the strike, its average thickness is 60-65 meters, and it dips to the southwest at a 45- to 60-degree angle. The ore is varied in physical properties (from porous to very solid). The average coefficient for solidity, according to the scale of "Glavmed" (Main Administration of the Copper Industry), is 6-8.

The lentil is opened by two vertical shafts and is undercut to the north by a 1,619-meter tunnel. The shafts are joined by crosscuts with the drift of the footwall and by crossdrifts with the drift of the hanging wall. The upper part of the deposit is worked on two levels: the level between 373 and 405 meters is worked by horizontal cuts with fill but without timbering and by the system of sublevel drifts; the level above 405 meters is worked by top slicing. (1) All mined ore is chuted to the level of the tunnel and from there is transported by electric locomotive to the lower industrial area, to the crushing and screening installation, and then to the railroad bunkers.

The mine has up-to-date equipment. Several basic labor-consuming processes, however, had not been mechanized completely until recently, and this had delayed a further increase in mine output and in labor productivity. At the end of 1945, when a plan for complex mechanization of the mine was proposed, hand labor constituted 27 percent of the total work involved in ore loading in advancing the workings, 12.9 percent of ore loading at the faces, and 25 percent in filling the rooms.

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During the postwar Five-Year Plan, a number of important problems were solved successfully by the mine's engineers and technicians, making it possible in 1949 to achieve complex mechanization of basic mining operations.

For drilling operations in all working faces, a steady supply of compressed air at 5.5-6 atmospheres is provided. R-39, OM-506, and PA-23 hand drill hammers and TP-4 telescope drill hammers are used. These hand drills are installed on extension-type support columns.

Until 1946, the speed of advancing the faces did not usually exceed 15-20 meters per month. From 1946 on, the mine began to use the previously abandoned SG-15 scraper loaders and introduced FML-4 loading machines. Thus, in 1949, hand loading in advancing the faces was completely abolished and the speed of advancing the faces reached 60 meters per month.

In mining out the faces, hand labor was used for the most part in loading the ore under the top slicing and room and pillar method and also in filling the rooms and delivering support timber.

Ural copper mines are making extensive use of the variant of top slicing which employs accumulation drifts. Under these conditions, the mines began mass introduction of scraper winches, thereby sharply reducing the volume of hand labor. The extent of hand labor, however, was still considerable in these operations because it was necessary to load ore by hand in the short approaches (zakhodka) and at the beginning of crosscuts. Later on, a method of using scraper winches in these areas was found, and hand labor in loading ore in the top slicing system was completely eliminated in 1949.

In recent years, 15-kilowatt scraper winches have been introduced in the place of low-power 10-kilowatt winches and the distance between the ore chutes has been cut to 12-15 meters instead of the former 18-20 meters. These improvements helped to mechanize effectively ore loading and filling of rooms in mining rooms by horizontal slicing.

LS-2 and LU-15 10-15 kilowatt scraper winches are used in mining the faces. They are reinforced by two or three buntons and additional timbers are not needed. The work of installing the winch, including the time used in delivering it to the work area, takes no more than 4-5 hours. Rake-type scrapers with a capacity of 0.15 cubic meter are used. It is rarely necessary to bring winches to the surface machine shops, since capital repairs are done at the work area. In the accumulation drifts in the sublevel cross-cut system, 25-kilowatt scraper winches with 0.3-cubic-meter capacity scrapers are used. These have a productivity of up to 500 tons of ore per day.

The number of operating scraper winches increased in 1949 by 64 percent over 1946 and the number of timber-hoisting pneumatic winches increased 3.5 times. The decisive factor in the high productivity of the scraper winches is the creation of a permanent and well-trained group of scraper operators, a profession which has been successfully mastered by women at the Blyavinskiy Mine.

Support timber and other materials are conveyed entirely by electric locomotive and are hoisted by LK-1 one-drum pneumatic winches.

In 1949, the Blyavinskiy Mine achieved complete mechanization of basic processes of mining as a result of all these measures. Filling operations also have been mechanized. On the surface, the fill material is carried to the hoist winches by scraper winches. The rooms are filled also with the aid of scraper winches and by chuting of waste from the caving zone (in filling

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rooms which have been worked by sublevel crosscuts). The cavities left under the overhead block of untouched ore when the rooms are fully mined out, are filled with a clayey pulp, and are sometimes filled by hand, since a method of mechanization has not yet been found for these conditions.

Trolley-type electric locomotives and VOK-160 cars with a 1.6-cubic-meter capacity are used in underground haulage of fill material. A one-drum scraper winch with a DC motor operating from the overhead network is assembled on the locomotive for dumping the car. Complete mechanization has helped not only to meet current fill operations, but also to eliminate in 1949 the lag in filling old rooms.

In 1949, the Blyavinskiy Mine was able to do away with hand labor in all those operations in which it had long been used.

Table 1. Mechanization of Underground Operations  
at Blyavinskiy Mine (percent)

<u>Type of Work</u>	<u>End of 1945*</u>	<u>1946</u>	<u>1949</u>
Loading in advancing operations.	73.0	84.0	99.6
Loading in mining the faces	87.1	90.0	99.6
Filling rooms	75.0	89.5	100.0

\* In the period when the complex mechanization plan for the mine was being drawn up.(2)

Table 2 shows the volume of transport work done by mechanized methods, in percent of the total volume of work:

Table 2. Mechanization of Transport  
at Blyavinskiy Mine (percent)

<u>Year</u>	<u>Underground Haulage</u>	<u>Surface Haulage</u>	<u>Ore Loading on Railroad Cars</u>
1948	100	100	80
1949	100	100	100 (1)

Table 3 shows the share of different mining systems in the work of the mine:

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Table 3. Mining Systems Employed  
at Blyavinskiy Mine (percent)

<u>System</u>	<u>1945</u>	<u>1946</u>	<u>1949</u>
Top slicing	38.0	36.0	71.5
Horizontal slicing with fill, without timbering	41.3	36.0	20.3
Sublevel crosscuts	20.7	28.0	8.2

Trolley-type electric locomotives with weight on drivers from 6-14 tons and Soviet-built cars with a capacity of 1.6-2.2 cubic meters, are used for all underground and surface haulage of ore. The cars are unloaded on unloading curves at reduced locomotive speed.

The surface crushing and screening installation for crushing and sorting ore according to size has been completely mechanized. Loading of ore into railroad cars is done from bunkers and by excavators (from dumps).

The steadily increasing level of mechanization at the mine has resulted in a continual rise in output of ore and in labor productivity, despite the increase in the use of the top slicing method, a more labor-consuming method of mining. In 1949, ore output increased 23.1 percent over 1948 and 81 percent over 1946. Labor productivity of mine workers increased correspondingly by 10 and 28 percent.

The Blyavinskiy Mine is now planning to introduce complete mechanization in all surface operations and to improve mechanization of mining operations. The following measures should be put into effect for these goals:

1. Completely mechanize loading and unloading, particularly in connection with railroad transport -- unloading of timber, scrap, fuel and equipment, loading of metal scrap and apportioning the ore when loading into cars on scales; mechanize timbering and filling and organize storehouses on the surface for this purpose.
2. Convert scraper winches to remote control and introduce removable drill bits and drill carriages in advancing the workings; discover a method of mechanizing the timbering of faces and advance workings.
3. Increase skills of workers operating machines and improve the operation and productivity of the machines.
4. Improve the technology of mining ore by top slicing and provide maximum recovery of lump ore.(2)

#### SOURCES -

1. Moscow, Mekhanizatsiya Trudoyemkikh i Tyazhelykh Rabot, Vol 4, No 4, Apr 50
2. Moscow, Gornyy Zhurnal, No 7, Jul 50

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